Problem Set 3 Wednesday June 18, 2003

Problem 1:

The difference orbit shown in the figure resulted from subtracting the orbit after changing corrector S8B:V4 by + 2 Amps from the orbit taken just before making this change.

Given:

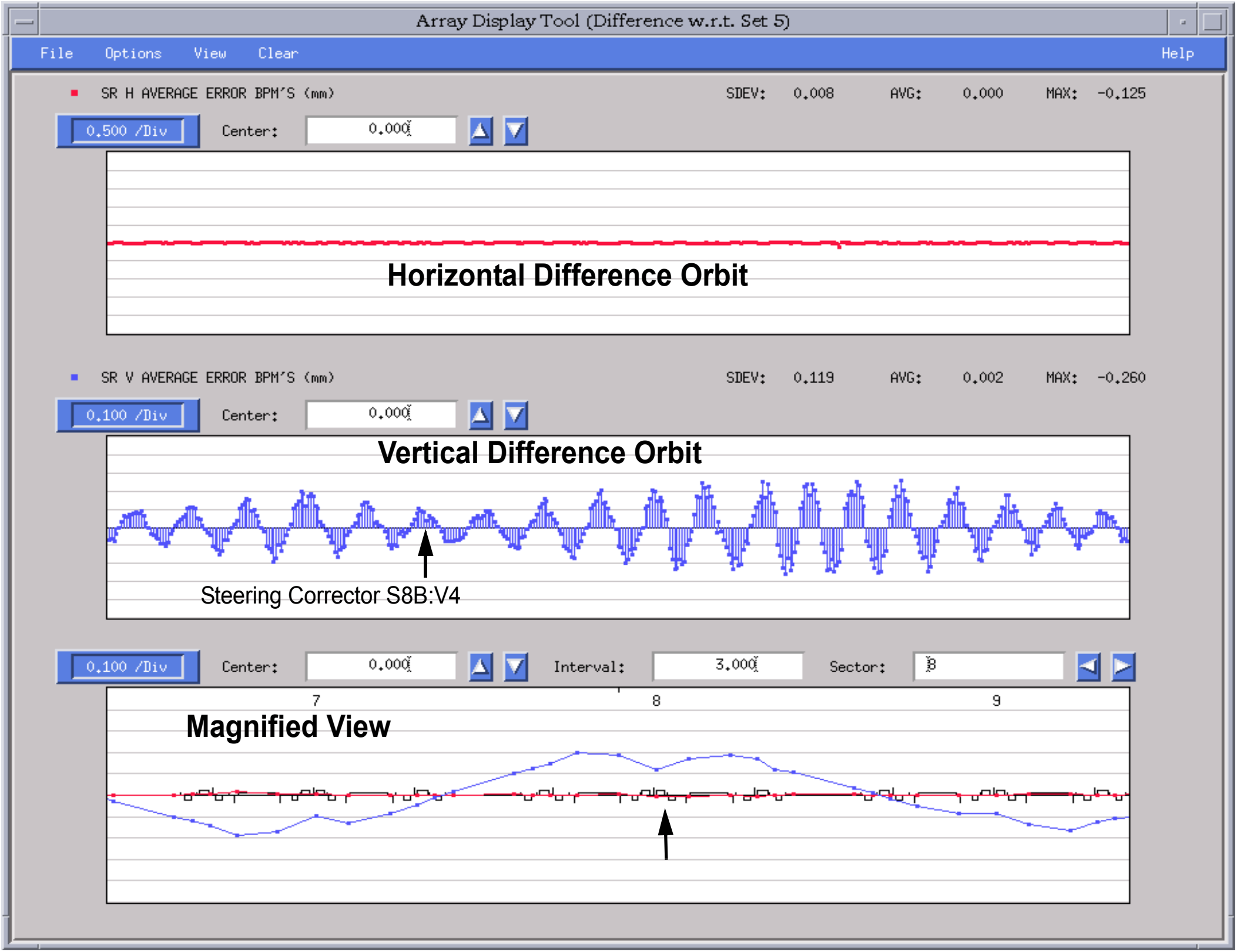
* The value of the vertical beta function at the location of corrector S8B:V4 is 25 meters
* The machine energy is 7.00 GeV
* Note 1 Tesla = 10 kGauss = 10,000 Gauss

5a) What is the integer part of the vertical tune?

5b) Is the fractional part of the tune less than 0.5 or greater than 0.5 ?

5c) What is the approximate corrector calibration in, Gauss-meters / Amp, milliradians / Amp

5d) The full-scale range of the steering correctors is +- 150 Amps. How many milliradians is this?


Array Display Tool (Difference w.r.t. Set 5)
File
Options
View
Clear
Help
SR H AVERAGE ERROR BPM'S (mm)
SDEV: 0.008
AVG: 0.000
MAX: -0.125
0.500 /Div
Center: 0.000
Horizontal Difference Orbit
SR V AVERAGE ERROR BPM'S (mm)
SDEV: 0.119
AVG: 0.002
MAX: -0.260
0.100 /Div
Center: 0.000
Vertical Difference Orbit
Steering Corrector S8B:V4
0.100 /Div
Center: 0.000
Interval: 3.000
Sector: 8
7
8
9
Magnified View

Problem 2:

2a) Consider the three quadrupoles mounted on a typical APS girder, Q1, Q2, Q3, of effective length $l_1 = l_3 = l = (5 / 8)\, l_2 = 0.5$ m separated by distances L = 0.6 m. The quadrupole strengths $k1 = k3 = k_f = 0.5 / m^2$, $k2 = k_d = -0.7 / m^2$. Given the separation L, use the thin lens approximation (assuming the thin lenses act at the center of each quad) to obtain a formula for the effective focal length of the triplet (don't put numbers in yet).

2b) Calculate to the focal lengths of the three magnets individually and compare to the focal length of the triplet using the numerical parameters given in 2a.